APPLICATION NOTE

Aircraft Air Management and Environmental Cooling Systems, Cooling Effect Detector (CED)

Application Note Case Study ANCS003A

FCI AEROSPACE
A PST BRAND

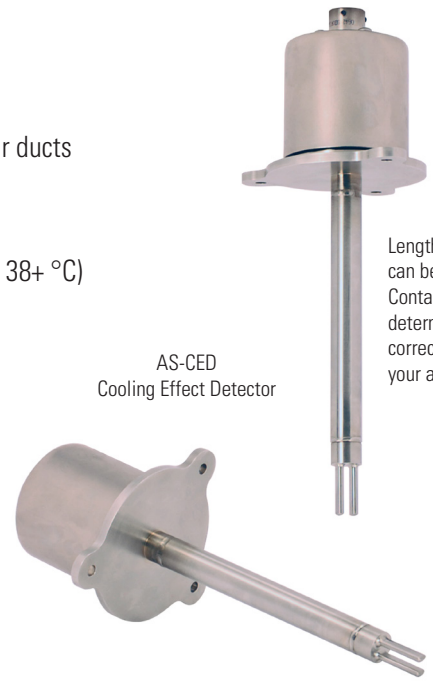
Safe and reliable operation of Aircraft Air Management and Environment Cooling Systems (ECS) are vital to pilot and passenger comfort, proper cooling for today's high-power electronics, and ensuring critical subsystems such as bleed air/anti-icing are operating as designed. Accurate flow and temperature data are key to optimal performance of these complex systems. Low flow detection in these conditioned air applications is especially a challenge since it varies with the cooling air temperature. FCI has the perfect solution for this important requirement with its fully qualified Cooling Effect Detector (CED).

Problem

- Air Management Systems require a highly reliable low air flow alarm as a function of temperature to signal inadequate cooling of key aircraft systems with a single device.
- Cooling Effect Detectors (CEDs) must operate in the harsh aircraft environments including a wide range of varying temperature and pressure conditions, with high reliability and low maintenance support.
- Commercial and military aircraft components must meet stringent qualification requirements including vibration, Electrical Magnetic Interference (EMI), Radio Frequency Interference (RFI), and high MTBF in salt/fog environments defined by the commercial and military specifications.
- Traditional mechanical and electronic flow switches do not provide a single, calibrated, integrated flow and temperature output.
- Other technologies often used in these applications, such as venturi flow meters, inherently require a pressure drop which impacts system performance and efficiency
- Mechanical flow switches, with their moving parts, require routine maintenance and come with very low Mean Time Between Failure (MTBF) proven performance.

Flow and Temperature Conditions

- **Pipe and Duct Diameters:** 1 to 10 inches+ (25 to 250 millimeter+) air ducts
- **Typical CED Operating Flow/Temperature Range:**
  0.5 to 200 Standard Feet/Second (.15 to 61 Standard Meters/Second)
  integrated with temperature range between 0 °F to 100+ °F (-18 °C to 38+ °C)
- **Media:** Air
- **Fluid Operating Pressures:** 0 to 200 PSIG (0 to 1,380 kpa)
- **Fluid Operating Temperatures:** -40 °F to 350 °F (-40 °C to 177 °C)
- **Environmental Temperatures:** -40 °F to 250 °F (-40 °C to 121 °C)



AS-CED
Cooling Effect Detector

Length of probe can be adjusted. Contact FCI to determine the correct length for your application.

APPLICATION NOTE

Aircraft Air Management and Environmental Cooling Systems, Cooling Effect Detector (CED)

Application Note Case Study ANCS003A

Solution and Benefits: FCI Cooling Effect Detector (CED) Switch

- FCI's CED sensor offers reliable low air flow detection as a function of media temperature.
- No moving parts thermal dispersion technology provides maintenance free operation.
- Full commercial and aircraft qualification: DO160G, Mil-STD-810, MIL-STD-461, MIL-STD-704.
- Single flange mount, no need for additional tap holes for pressure and temperature sensors.
- Stainless Steel wetted parts and enclosures resists corrosive salt water/fog exposure.
- Factory calibrated across wide integrated flow and temperature range to customer's output.
- Normally Open or Normally Closed configurations available.
- Proven reliability: 50,000+ hours MTBF, maintenance free service life.
- FCI quality management system is ISO9001 and AS9100 certified.

FCI's Flight Qualified Cooling Effect Detector (CED) utilizes the FCI exclusive thermal dispersion technology (TDT) to provide an alarm condition if inadequate cooling is present as a function of both flow rate and temperature. FCI programs CED sensors to accommodate customer specific flow vs. temperature curves since every aircraft has unique cooling requirements. FCI utilizes its NIST Traceable laboratory to calibrate the CED Switch in air at varying temperatures and flow rates, and then records the data into the FCI CED Switch's firmware. The CED Switch output is an integrated, calibrated single switch point that will alarm if the cooling effect falls below the accepted upper and lower limit of the requirements curve (refer to graph).

Typical Cooling Effect Detector (CED) Operational Requirement: